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ATLAS OF ZEOLITE STRUCTURE TYPES

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1996**

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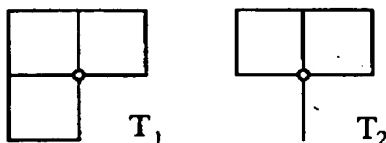
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ERI**ERIONITE****P6₃/mmc****Framework density:** 15.6 T/1000 Å³**Loop configuration
of T-atoms:**

Coordination sequences: T₁(24) 4 9 17 30 50 75 98 118 144 185
 T₂(12) 4 10 20 32 46 64 90 126 164 196

Channels: ⊥ [001] 8 3.6 x 5.1***

Type material: **Erionite** (Na₂,Ca_{..})_{3.5}K₂[Al₉Si₂₇O₇₂] · 27 H₂O
 hexagonal, P6₃/mmc, a=13.3, c=15.1 Å⁽¹⁻³⁾

Framework description: AABAAC sequence of 6-rings

**Isotypic framework
structures:** AlPO₄-17 plus numerous compositional variants^(4,5)
 LZ-220⁽⁶⁾
 Linde T (ERI-OFF structural intermediate)⁽⁷⁾

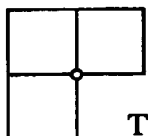
References:

- (1) L. W. Staples and J. A. Gard, Mineral. Mag. 32, 261 (1959).
- (2) A. Kawahara and H. Curien, Bull. Soc. Fr. Mineral. Crystallogr. 92, 250 (1969).
- (3) J. A. Gard and J. M. Tait, Proc. 3rd IZC, Recent Progress Reports (Leuven UP, 1973), p 94.
- (4) J. J. Pluth, J. V. Smith and J. M. Bennett, Acta Cryst. C42, 283 (1986).
- (5) See AEL ref. 2.
- (6) D. W. Breck and G. W. Skeels, US Patent 4,503,023 (1985).
- (7) D. W. Breck, Zeolite Molecular Sieves (Wiley, 1974), p 173.

FAU**FAUJASITE****Fd $\bar{3}$ m**

Framework density: 12.7 T/1000 Å³

Loop configuration
of T-atoms:



Coordination sequences: T(192) 4 9 16 25 37 53 73 96 120 145

Channels: <111> 12 7.4***

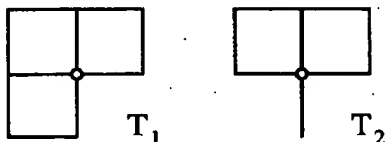
Type material: Faujasite (Na₂Ca,Mg)₂₉[Al₅₈Si₁₃₄O₃₈₄] · 240 H₂O
cubic, Fd $\bar{3}$ m, a=24.7 Å^(1,2)

Isotypic framework
structures:

Beryllophosphate X⁽³⁾
CSZ-1 (EMT-FAU structural intermediate)⁽⁴⁾
ECR-30 (EMT-FAU structural intermediate)⁽⁵⁾
Linde X^(6,7)
Linde Y^(8,9)
LZ-210⁽¹⁰⁾
SAPO-37⁽¹¹⁾
Zincophosphate X⁽³⁾
ZSM-20 (EMT-FAU structural intermediate)⁽¹²⁾
ZSM-3 (EMT-FAU structural intermediate)⁽¹³⁾
and numerous other compositional variants

References:

- (1) G. Bergerhoff, W. H. Baur and W. Nowacki, N. Jb. Miner. Mh. 1958, 193 (1958)
- (2) W. H. Baur, Am. Mineral. 49, 697 (1964)
- (3) T. E. Gier and G. D. Stucky, Zeolites 12, 770 (1992).
- (4) M. G. Barrett and D. E. W. Vaughan, UK Patent GB 2,076, 793 A (1981).

LTL**LINDE TYPE L****P6/mmm****Framework density:** 16.4 T/1000 Å³**Loop configuration
of T-atoms:**

Coordination sequences: $T_1(24)$ 4 9 17 29 46 69 98 131 162 187
 $T_2(12)$ 4 10 21 35 49 66 89 117 150 190

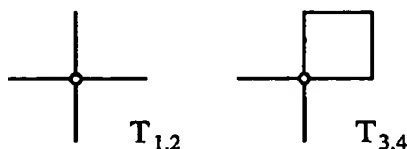
Channels: [001] 12 7.1*

Type material: Linde Type L $K_6Na_3[Al_9Si_{27}O_{72}] \cdot 21 H_2O$
 hexagonal, P6/mmm, $a=18.4$, $c=7.5$ Å⁽¹⁾

**Isotypic framework
structures:** Gallosilicate L^(2,3)
 (K,Ba)-G,L⁽⁴⁾
 LZ-212⁽⁵⁾
 Perliälite^(6,7)

References:

- (1) R. M. Barrer and H. Villiger, Z. Kristallogr. **128**, 352 (1969).
- (2) P. A. Wright, J. M. Thomas, A. K. Cheetham, A. K. Nowak, Nature **318**, 611 (1985).
- (3) J. M. Newsam, Mater. Res. Bull. **21**, 661 (1986).
- (4) C. Baerlocher and R.M. Barrer, Z. Kristallogr. **136**, 245 (1972).
- (5) D. W. Breck and G. W. Skeels, US Patent 4,503,023 (1985).
- (6) G. Artioli and A. Kvick, Eur. J. Mineral. **2**, 749 (1990).
- (7) Y. P. Menshikov, Zap. Vses. Mineral. O-va. **113**, 607 (1984).

MOR**MORDENITE****Cmcm****Framework density:** 17.2 T/1000 Å³**Loop configuration
of T-atoms:**

Coordination sequences:

$T_1(16)$ 4 12 22 38 60 88 115 155 204 242
 $T_2(16)$ 4 12 20 37 64 87 114 154 198 241
 $T_3(8)$ 4 11 24 39 54 86 126 156 195 242
 $T_4(8)$ 4 11 24 39 60 92 122 148 195 250

Channels: [001] 12 6.5 x 7.0* ↔ [010] 8 2.6 x 5.7*

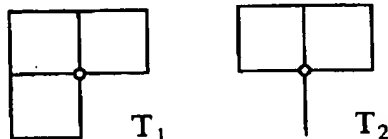
Type material: **Mordenite** Na₈[Al₈Si₄₀O₉₆] · 24 H₂O
 orthorhombic, Cmcm, a=18.1, b=20.5, c=7.5 Å⁽¹⁾

Isotypic framework structures:	Ca-Q ⁽²⁾	Maricopaite (interrupted framework) ⁽⁶⁾
	Gallosilicate MOR ⁽³⁾	Na-D ⁽⁷⁾
	Large port mordenite ⁽⁴⁾	Zeolon
	LZ-211 ⁽⁵⁾	

Alternate designations:	Ptilolite	Flokite (discredited)
	Arduinite (discredited)	

References:

- (1) W. M. Meier, Z. Kristallogr. **115**, 439 (1961).
- (2) M. Koizumi and R. Roy, J. Geol. **68**, 41 (1960).
- (3) M.J. Eapen, K.S.N. Reddy, P.N. Joshi and V.P. Shiralkar, J. Incl. Phen. Mol. Recogn. Chem. **14**, 119 (1992).
- (4) L. B. Sand, Molecular Sieves, Soc. of Chem. Industry, London, p. 71 (1968).
- (5) D. W. Breck and G. W. Skeels, US Patent 4,503,023 (1985).
- (6) R. Rouse and D. R. Peacor, Am. Mineral. **79**, 175 (1994).
- (7) R. M. Barrer and E. A. D. White, J. Chem. Soc. **1952**, 1561 (1952).

OFF**OFFRETITE** **$P\bar{6}m2$** **Framework density:** 15.5 T/1000 Å³**Loop configuration
of T-atoms:**

Coordination sequences: $T_1(12)$ 4 9 17 30 50 75 98 118 144 185
 $T_2(6)$ 4 10 20 32 46 66 94 128 162 192

Channels: [001] 12 6.7* \leftrightarrow \perp [001] 8 3.6 x 4.9**

Type material: Offretite $(Ca,Mg)_{1.5}K[Al_4Si_{14}O_{36}] \cdot 14 H_2O$
 hexagonal, $P\bar{6}m2$, $a=13.3$, $c=7.6$ Å^(1,2)

Framework description: AAB sequence of 6-rings

**Isotypic framework
structures:** Linde T (ERI-OFF structural intermediate)⁽³⁾
 LZ-217⁽⁴⁾
 TMA-O⁽⁵⁾

References:

- (1) J. M. Bennett and J. A. Gard, *Nature* **214**, 1005 (1967).
- (2) J. A. Gard and J. M. Tait, *Acta Cryst.* **B28**, 825 (1972).
- (3) D. W. Breck, *Zeolite Molecular Sieves* (Wiley, 1974) p. 103.
- (4) D. W. Breck and G. W. Skeels, US Patent 4,503,023 (1985).
- (5) R. Aiello, R. M. Barrer, J. A. Davies and I. S. Kerr, *Trans. Farad. Soc.* **66**, 1610 (1970).

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